Report for 2003TX97B: Groundwater Data Modeling for Arc Hydro

- Other Publications:
  - Strassberg, G., Maidment, D. R. Arc Hydro groundwater data model. AWRA May 2004 Spring Specialty Conference on GIS and Water Resources (Paper accepted).
  - Strassberg, G., Maidment, D. R. Arc Hydro groundwater data model. AGU fall meeting 2003.

Report Follows

Arc Hydro groundwater data model – Progress report June 2004
David R. Maidment and Gil Strassberg

a) ***research-related activities [i.e., tests or experiments you conducted]:***
We are in the process of designing a data model to represent groundwater systems within GIS. Activities related to the data model development are:

- **Review of available data models**: The review helps to understand how to conceptually describe three dimensional phenomena dealing with subsurface properties and how to represent measurements at wells and boreholes. Data models reviewed included the Petroleum Public Data Model, The EarthFX data model, the North American data model and the marine science data model.

- **Design of a data model interface for MODFLOW**: A draft data model interface was designed for MODFLOW. MODFLOW is the most common software package used in groundwater modeling. The data model interface is a database design for storing MODFLOW inputs and outputs within GIS.

- **Integration of GAM models from the TWDB with the MODFLOW data model interface**: model inputs and outputs from the TWDB Groundwater Availability Models (GAM) were integrated with the MODFLOW data model interface. Information from GAM models of the Carrizo Wilcox and the Northern Edwards aquifers were integrated into GIS using the MODFLOW interface data model.

- **Experiments on how to construct three dimensional objects within ArcGIS**: Experiments with the three dimensional objects within ArcGIS are conducted to assess the possibilities of using three dimensional objects for describing groundwater features. Features such as cross sections, well hydrostratigraphy, and volumetric objects are being stored in a spatial database, and tools are being developed to create these features.

- **Design of a draft data model:** A draft data model has been designed, and a document presenting the data model is being circulated among groundwater professionals for review. Once the review process is complete a more detailed design will be completed from the draft data model.

b) ***insights to what you learned during the research [i.e., preliminary results]***
The experiments and design processes described above expanded our knowledge and understanding of groundwater systems and how they are conceptually described and modeled. We learned how MODFLOW is

constructed, and what are the parameters needed to model groundwater. We also gained a better understanding on the use of GIS to represent three dimensional phenomena.

c) Experiences where you shared information about the project [i.e., scholarly accomplishments, and citations of presentations, papers, abstracts, etc.]

Papers:
- Gil Strassberg and David R. Maidment. Arc Hydro groundwater data model. AWRA May 2004 Spring Specialty Conference on GIS and Water Resources (Paper accepted).

Presentations:
- Gil Strassberg and David R. Maidment. Arc Hydro groundwater data model. AGU fall meeting 2003.

d) Progress you made in expending funds [were all the funds spent?]

Out of the $4,182 granted, $3,500 was used for the following purposes:
- Purchase of a computer hardware.
- Purchase of technical books.
- Computer software license.

e) progress on your graduate degree program

All the following are at the University of Texas at Austin department of Civil Engineering:
- Graduated from the Masters program in May 2003.
- Passed qualifier exam in September 2004.
- Formally accepted as a ph.D candidate in January 2004.
- Defended dissertation proposal in May 2004.
- Expected graduation in May 2005.

f) Related activities that your Chairman may have involved in as a result of this grant [i.e., did this grant lead to follow-up funding or did it support other projects?]